

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
23 August 2001 (23.08.2001)

PCT

(10) International Publication Number  
**WO 01/60219 A1**

(51) International Patent Classification<sup>7</sup>: A47J 31/06, B65D 81/00

(72) Inventors: LAZARIS, Nicholas, G.; 1947 Beacon Street, Newton, MA 02468 (US). BUCUZZO, William, P.; 41 Eudora Street, Haverhill, MA 01832 (US).

(21) International Application Number: PCT/US01/40123

(74) Agents: GAUTHIER, Maurice, E. et al.; Samuels, Gauthier & Stevens, Suite 3300, 225 Franklin Street, Boston, MA 02110 (US).

(22) International Filing Date: 16 February 2001 (16.02.2001)

(25) Filing Language: English

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(26) Publication Language: English

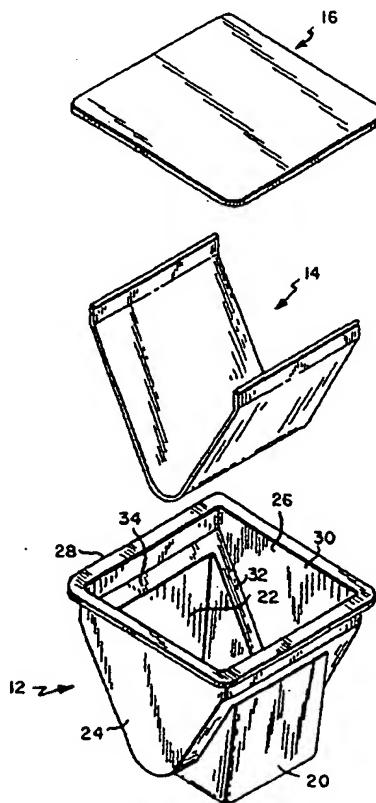
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European

(30) Priority Data:  
60/183,606 18 February 2000 (18.02.2000) US  
09/782,660 13 February 2001 (13.02.2001) US

(71) Applicant: KEURIG, INC. [US/US]; 101 Edgewater Drive, Wakefield, MA 01880 (US).

[Continued on next page]

(54) Title: DISPOSABLE SINGLE SERVE BEVERAGE FILTER CARTRIDGE



(57) Abstract: A beverage filter cartridge includes an outer container (12) with a bottom, and front (20), back and side walls (24, 26) extending upwardly from the bottom to a peripheral rim surrounding an upper opening. The side wall is contoured to define interior ledges (32, 34) located above the bottom and extending between the front and back walls. A planar filter element (14) having front, back and side edge regions is configured, dimensioned and positioned to subdivide the interior of the container into first and second chambers, with the front and back edge regions of the filter element secured respectively to the front and back walls of the container, and with side edge regions of the filter element secured to respective interior ledges of the container side walls. A beverage medium is stored in the first chamber. A cover (16) is joined to the container rim (28) to close the upper opening. The cover is yieldably piercable to accommodate an inflow of liquid into the first chamber for combination with the beverage medium to produce a beverage. The filter element is permeable to accommodate passage of the beverage from the first chamber into the second chamber, and the container bottom is yieldably piercable to accommodate an outflow of the beverage from the second chamber to the exterior of the cartridge.

WO 01/60219 A1



patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

**Published:**

— with international search report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## DISPOSABLE SINGLE SERVE BEVERAGE FILTER CARTRIDGE

CROSS REFERENCES TO RELATED APPLICATIONS

5        This application claims priority from U.S. Provisional Patent Application Serial No. 60/183,606 filed 02/18/2000 and U.S. Utility Patent Application filed on February 13, 2001 (serial no. unknown), both of which are incorporated herein by reference in their entirety.

10

FIELD OF THE INVENTION

This invention relates to disposable single serve beverage filter cartridges.

15

DESCRIPTION OF THE PRIOR ART

A known disposable single serve beverage filter cartridge is disclosed in U.S. Patent Nos. 5,325,765 and 5,840,189 (Sylvan et al), dated respectively July 5, 1994 20 and November 24, 1998. This beverage filter cartridge is comprised basically of an impermeable yieldably piercable cup-shaped container internally subdivided by a permeable cone-shaped filter into first and second chambers. A granular or powdered dry beverage medium, e.g., roasted ground coffee, is stored in the first chamber, and the container is closed by an impermeable yieldably piercable lid.

25        During a brewing cycle, the lid and container bottom are pierced, respectively, by tubular inlet and outlet probes. The inlet probe admits heated liquid into the first chamber for infusion with the beverage medium, and the resulting brewed beverage passes through the filter into the second chamber from which it exits via the outlet probe for delivery to an underlying cup.

30        This known beverage filter cartridge has gained rapid and increasingly widespread acceptance, notwithstanding certain problems and disadvantages relating to its production and subsequent use that have persisted since its initial introduction.

For example, expensive and mechanically complex production equipment is

required both to form the cone-shaped filter from a sheet of filter media, and to insert and secure the thus formed filter cone in the cartridge container. Slight deviations from close tolerances governing these steps can cause the filter to rupture or become dislodged from the container wall during the brewing cycle, resulting in contamination 5 of the brewed beverage with beverage medium residue from the first chamber.

Because of its cone-shaped configuration, the filter has a limited extract storage capacity of less than 60% of the internal volume of the cup-shaped container. The unoccupied volume surrounding the filter component, commonly referred to as "head space", is largely wasted and thus adds disadvantageously to the overall size of the 10 beverage filter cartridge. The additional head space also increases the likelihood of residual oxygen being left in the container, thus adversely affecting product shelf life. The cone-shaped configuration of the filter also limits the area available for lid puncture and inflow of liquid for infusion with the beverage medium.

Also, the side wall of the cup-shaped container is relatively pliable and thus 15 prone to buckling as the brewer probes puncture the container bottom and lid at the onset of the brewing cycle. This can adversely affect the puncturing process, resulting in leakage around the probes.

What is needed, therefore, is an improved beverage filter cartridge which 20 obviates or at least significantly minimizes the above-noted problems and disadvantages.

#### SUMMARY OF THE INVENTION

25 In accordance with the present invention, a beverage filter cartridge includes an outer container having a bottom with front, back and side walls extending upwardly to a peripheral rim surrounding an upper opening. The side walls are suitably contoured to minimize headspace, increase rigidity, and to define interior filter-supporting ledges located above the bottom and extending between the front and back walls. A planar 30 filter element subdivides the interior of the container into first and second chambers, with the first chamber having a volumetric storage capacity of at least about 80% of the total internal volume of the outer container. Front and back edge regions of the filter element are secured respectively to the front and back walls of the container, and edge

regions of the filter component are likewise secured to the interior ledges of the container side walls.

A beverage medium is stored in the first chamber, and a lid is applied to the peripheral container rim to seal off the upper opening.

5       The planer filter element is readily formed from a sheet of filter media, and is easily inserted and secured in place. The front and back container walls and the interior ledges of the side walls offer ample support surfaces against which edge regions of the filter element may be reliably secured. The contoured container side walls contribute advantageously to a heightened rigidity which beneficially resists  
10 buckling when the lid and container bottom are pierced at the onset of a brewing cycle.

The relatively large volume of the first chamber as compared to the second chamber translates into a more efficient package, making it possible to either increase the amount of beverage medium for a given overall cartridge size, or conversely, for a given amount of beverage medium, to decrease the overall cartridge size.

15       These and other features and advantages of the present invention will now be described in greater detail with reference to the accompanying drawings, wherein:

#### BRIEF DESCRIPTION OF THE DRAWINGS

20

Figure 1 is a perspective view of a beverage filter cartridge in accordance with the present invention;

Figure 2 is a larger scale exploded perspective view of the component parts of the beverage filter cartridge;

25       Figure 3 is a front elevational view of the beverage filter cartridge, the rear view being a mirror image of this view;

Figure 4 is a side elevational view of the beverage filter cartridge, the opposite side being a mirror image of this view;

Figure 5 is a vertical sectional view taken along line 5-5 of Figure 3;

30       Figure 6 is a vertical sectional view taken along line 6-6 of Figure 4;

Figure 7 is a horizontal sectional view taken along line 7-7 of Figure 6;

Figure 8 is an enlarged sectional view taken along line 8-8 of Figure 4; and

Figure 9 is a plan view on a reduced scale of the filter element prior to its

insertion in the cup-shaped container.

#### DETAILED DESCRIPTION

5

With reference to the drawings, a beverage filter cartridge in accordance with the present invention is generally depicted at 10. The cartridge components are illustrated separately in Figure 2, and include: an outer container 12, a planar filter element 14, and a lid 16.

10 The container 10 has a bottom wall 18, a front wall 20, a back wall 22, and side walls 24, 26. The front, back and side walls extend upwardly from the bottom wall to a peripheral rim 28 surrounding an upper opening 30.

The side walls 24, 26 are appropriately contoured to define generally V-shaped first ledges 32 extending between the front and back walls 20, 22, with the lower 15 portions of the ledges 32 being spaced above the container bottom 18, and the sides diverging upwardly at an angle  $\alpha$  with respect to the vertical, as shown in Figure 8.

As shown in Figures 4 and 6, the front and back walls 20, 22 have upper sections "X", intermediate sections "Y", and lower sections "Z". The intermediate sections Y define second ledges 34 which diverge upwardly at the same angle  $\alpha$  to 20 thereby provide continuations of the first ledges 32 extending across the front and back walls 20, 22.

The bottom 18 is preferably contoured to provide an upwardly protruding centrally located boss 36.

The container may be formed from impermeable yieldably piercable and heat 25 sealable materials, a preferred example being polyethylene/EVOH/polystyrene supplied by Curwood Flexible Packaging of Oshkosh, Wisconsin, USA.

The filter element 14 may be cut or blanked from any suitably pliable and permeable sheet material, a preferred example being cellulose polypropylene supplied by J.P. Crompton, Ltd. of Bury, Lancashire, England..

30 As shown in Figure 9, the filter element has front, back and side edge regions 14a, 14b and 14c. The filter element is configured, dimensioned and operatively positioned to subdivide the interior of the container into first and second chambers  $C_1$ ,  $C_2$ , with the volume of the first chamber  $C_1$  comprising at least about 80% of the

internal volume of the container 12. When thus positioned, it will be understood that the side edge regions 14c of the filter element are secured as by heat sealing to the first ledges 32 of the side walls 24, 26, and the front and back edge regions 14a, 14b are similarly secured to the second ledges 34 of the front and back walls 20, 22.

5 Preferably, the bottom of the filter element is also secured as by heat sealing as at 37 to the upwardly protruding boss 36.

A beverage extract 38 (shown only in Figures 6 and 8) is received through the upper opening 30 and stored in the first chamber C<sub>1</sub>. The upper opening is then closed by securing the lid 16, as by heat sealing, to the peripheral container rim 28. The lid 10 may be cut or blanked from any suitable impermeable heat sealable and yieldably piercable material, a preferred example being a metallic/polymer laminate supplied by Heat Seal-Winpak, Ltd. of Montreal, Canada.

At the onset of a brewing cycle, as shown in Figure 6, the lid 16 and container bottom 18 are pierced, respectively, by tubular inlet and outlet probes 40, 42. The 15 inlet probe admits heated liquid into the first chamber C<sub>1</sub> for infusion with the beverage medium 38. The resulting brewed beverage passes through the filter element 14 into the second chamber C<sub>2</sub> from which it exits via the outlet probe 42.

In light of the foregoing, it will now be appreciated by those skilled in the art that the present invention offers a number of significant advantages over the known 20 beverage filter cartridge described previously. For example, the planar filter element 14 lends itself to being readily blanked from sheet material and easily configured, inserted and secured in place in the container 12. The container ledges 32 and 34 provide relatively wide and readily accessible surfaces onto which edge regions of the filter element can be securely heat sealed. The large volume of the extract storage 25 chamber C<sub>1</sub> maximizes efficient utilization of the container interior. The contoured side walls 24, 26 lend rigidity to the overall structure and in so doing, resist buckling as the lid and container bottom are pierced by inlet and outlet probes.

The cartridge container is designed to maintain a controlled atmosphere of N<sub>2</sub>, CO<sub>2</sub> or other gas introduced during the manufacturing process. Once sealed, the 30 container will withstand an induced vacuum of at least 22" Hg for a prescribed period and will remain serviceable and protect the beverage medium contained in the storage chamber C<sub>1</sub>.

Although the outer container and lid have been described as being formed from impermeable materials, it will be understood by those skilled in the art that, alternatively, permeable materials may be employed for one or both of these components. Where permeable materials are employed, the completed cartridges will 5 preferably be subsequently enclosed, either individually or in batches, with impermeable wrappings. Materials for such wrappings are well known, and include for example EVOH films, aluminum foil, etc.

Although the present invention had been shown and described with respect to a preferred embodiment, various changes and modifications that are obvious to a person 10 skilled in the art to which the invention pertains, even if not shown or specifically described herein, are deemed to lie within the spirit and scope of the present invention. Any numbering of the elements of the following claims is merely for convenience and is not intended to suggest that the ordering of the elements of the claims has particular significance other than as otherwise expressed by the language of the claims.

15        What is claimed is:

1        1. A beverage filter cartridge comprising:  
2            an outer container having a bottom and front, back and side walls extending  
3            upwardly from said bottom to a peripheral rim surrounding an upper opening, said side  
4            walls being contoured to define interior ledges located above said bottom and extending  
5            between said front and back walls;

6            a planar filter element having front, back and side edge regions, said filter  
7            element being configured, dimensioned and positioned to subdivide the interior of said  
8            container into first and second chambers, with said front and back edge regions secured  
9            respectively to said front and back walls, and with said side edge regions secured to  
10          respective interior ledges of said side walls;

11          a beverage medium stored in said first chamber; and

12          a cover joined to said rim and closing said upper opening, said cover being  
13          yieldably piercable to accommodate an inflow of liquid into said first chamber for  
14          combination with the beverage medium to produce a beverage, said filter element being  
15          permeable to accommodate a flow of said beverage from said first chamber into said  
16          second chamber, and said bottom being yieldably piercable to accommodate an outflow  
17          of said beverage from said second chamber to the exterior of said cartridge.

1        2. The beverage filter cartridge of claim 1 wherein said interior ledges are  
2          generally V-shaped.

1        3. The beverage filter cartridge of claims 1 or 2 wherein said front and  
2          back walls have upper sections extending downwardly from said peripheral rim to  
3          intermediate sections, and lower sections extending downwardly from said intermediate  
4          sections to said bottom.

1        4. The beverage filter cartridge of claim 3 wherein said intermediate  
2          sections define second ledges joining said upper and lower sections.

1        5. The beverage filter cartridge of claim 4 wherein said second ledges taper  
2          inwardly from said upper sections to said lower sections.

1        6. The beverage filter cartridge of claim 3 wherein the front and back edge  
2          regions of said filter element are joined respectively to the intermediate sections of said  
3          front and back walls.

1        7. The beverage filter cartridge of claim 1 further comprising a central

2 boss on said bottom, said boss projecting into the interior of said container and into  
3 contact with said filter element.

1        8.      The beverage filter cartridge of claim 1 wherein the volume of said first  
2 chamber is at least about 80% of the volume of said container.

1        9.      The beverage filter cartridge of claim 1 wherein said outer container is  
2 impermeable.

1        10.     The beverage filter cartridge of claim 1 or 9 wherein said lid is  
2 impermeable.

1        11.     A beverage filter cartridge comprising:

2            an outer container having a bottom and front, back and side walls extending  
3 upwardly from said bottom to a peripheral rim surrounding an upper opening, said side  
4 walls being contoured to define interior first ledges located above said bottom and  
5 extending between said front and back walls, said first ledges being generally V-shaped  
6 and having sides diverging upwardly at an angle  $\alpha$ , said front and back walls having  
7 upper sections extending downwardly from said peripheral rim to intermediate  
8 sections, and lower sections extending downwardly from said intermediate sections to  
9 said bottom, said intermediate sections diverging upwardly at said angle  $\alpha$  to define  
10 second ledges;

11          a planar filter element having front, back and side edge regions, said filter  
12 element being configured, dimensioned and positioned to subdivide the interior of said  
13 container into first and second chambers, with said front and back edge regions secured  
14 respectively to said second ledges, and with said side edge regions secured to  
15 respective first ledges of said side walls;

16          a beverage medium stored in said first chamber; and

17          a cover joined to said rim and closing said upper opening, said cover being  
18 yieldably piercable to accommodate an inflow of liquid into said first chamber for  
19 combination with the beverage medium to produce a beverage, said filter element being  
20 permeable to accommodate a flow of said beverage from said first chamber into said  
21 second chamber, and said bottom being yieldably piercable to accommodate an outflow  
22 of said beverage from said second chamber to the exterior of said cartridge.

1        12.     A beverage filter cartridge comprising:

2       an outer container having a bottom and front, back and side walls extending  
3 upwardly from said bottom to a peripheral rim surrounding an upper opening, said side  
4 walls being contoured to define interior ledges located above said bottom and extending  
5 between said front and back walls;

6       a planar filter element having front, back and side edge regions, said filter  
7 element being configured, dimensioned and positioned to subdivide the interior of said  
8 container into first and second chambers, the volume of said first chamber being at  
9 least about 80% of the volume of said container, the front and back edge regions of  
10 said filter element being secured respectively to said front and back walls, and the side  
11 edge regions of said filter element being secured to respective interior ledges of said  
12 side walls;

13       a beverage medium stored in said first chamber; and

14       a cover joined to said rim and closing said upper opening, said cover being  
15 yieldably piercable to accommodate an inflow of liquid into said first chamber for  
16 combination with the beverage medium to produce a beverage, said filter element being  
17 permeable to accommodate a flow of said beverage from said first chamber into said  
18 second chamber, and said bottom being yieldably piercable to accommodate an outflow  
19 of said beverage from said second chamber to the exterior of said cartridge.

1       13.     A beverage filter cartridge comprising:

2       an outer container having a bottom and front, back and side walls extending  
3 upwardly from said bottom to a peripheral rim surrounding an upper opening, said side  
4 walls being contoured to define interior ledges located above said bottom and extending  
5 between said front and back walls, said bottom having a central boss projecting  
6 upwardly into the interior of said container;

7       a planar filter element having front, back and side edge regions, said filter  
8 element having a generally V-shaped configuration and being positioned to subdivide  
9 the interior of said container into first and second chambers, with said front and back  
10 edge regions secured respectively to said front and back walls, and with said side edge  
11 regions secured to respective interior ledges of said side walls, and with a bottom  
12 portion of said filter element secured to said boss;

13       a beverage medium stored in said first chamber; and

14       a cover joined to said rim and closing said upper opening, said cover being  
15 yieldably piercable to accommodate an inflow of liquid into said first chamber for

16 combination with the beverage medium to produce a beverage, said filter element being  
17 permeable to accommodate a flow of said beverage from said first chamber into said  
18 second chamber, and said bottom being yieldably piercable to accommodate an outflow  
19 of said beverage from said second chamber to the exterior of said cartridge.

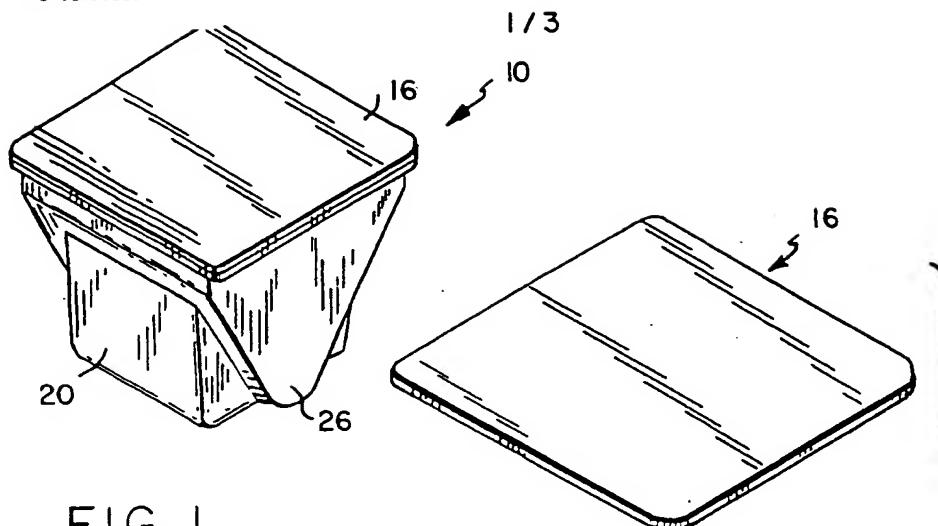


FIG. 1

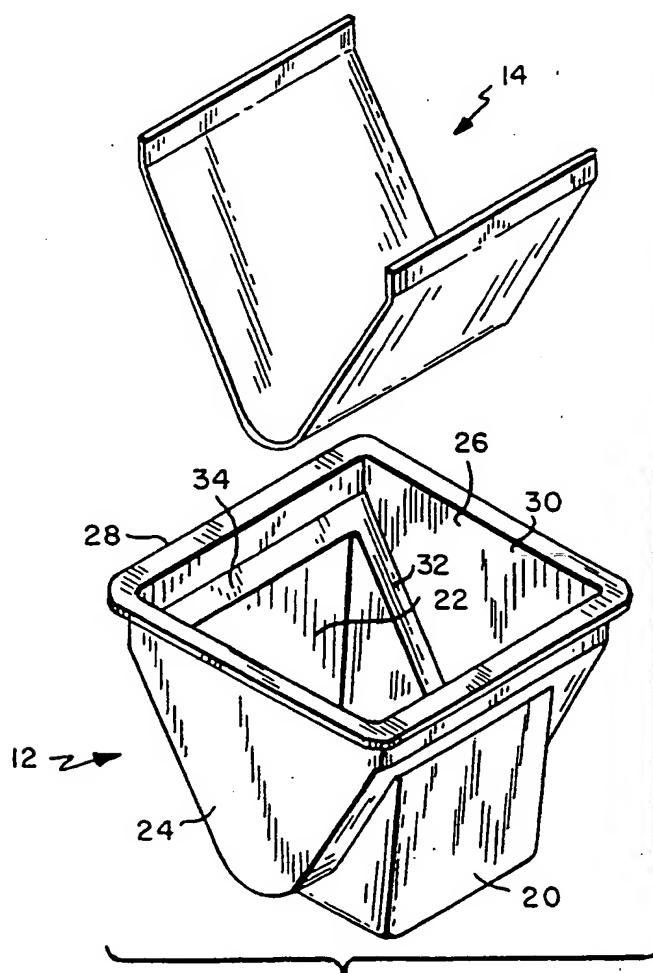


FIG. 2

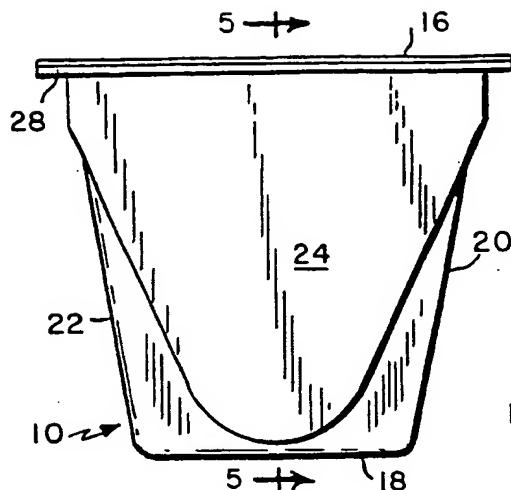


FIG. 3

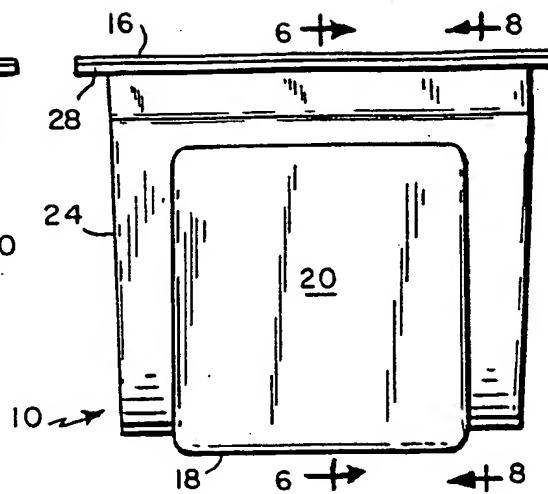


FIG. 4

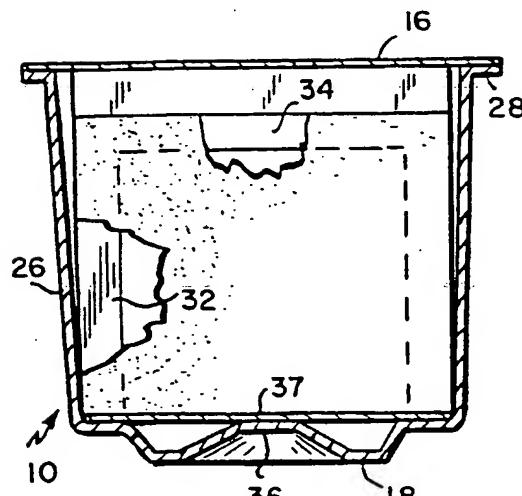


FIG. 5

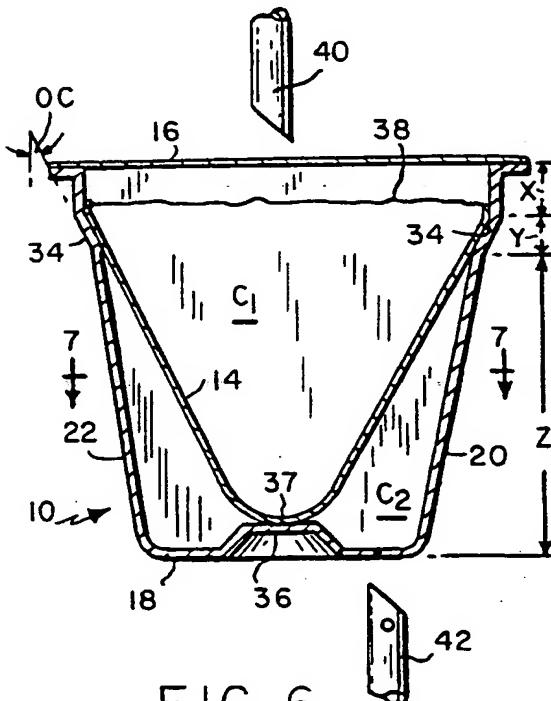


FIG. 6

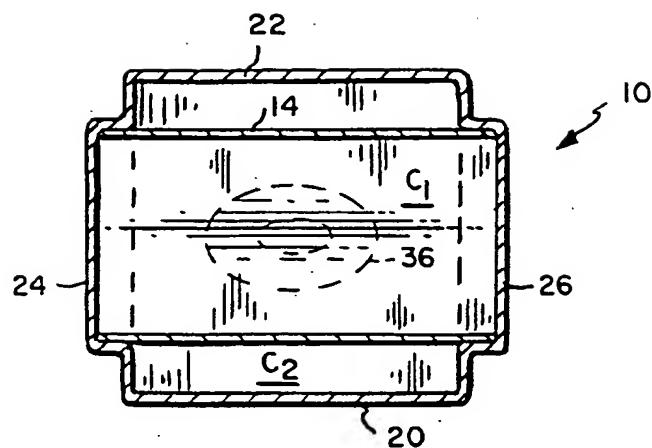


FIG. 7

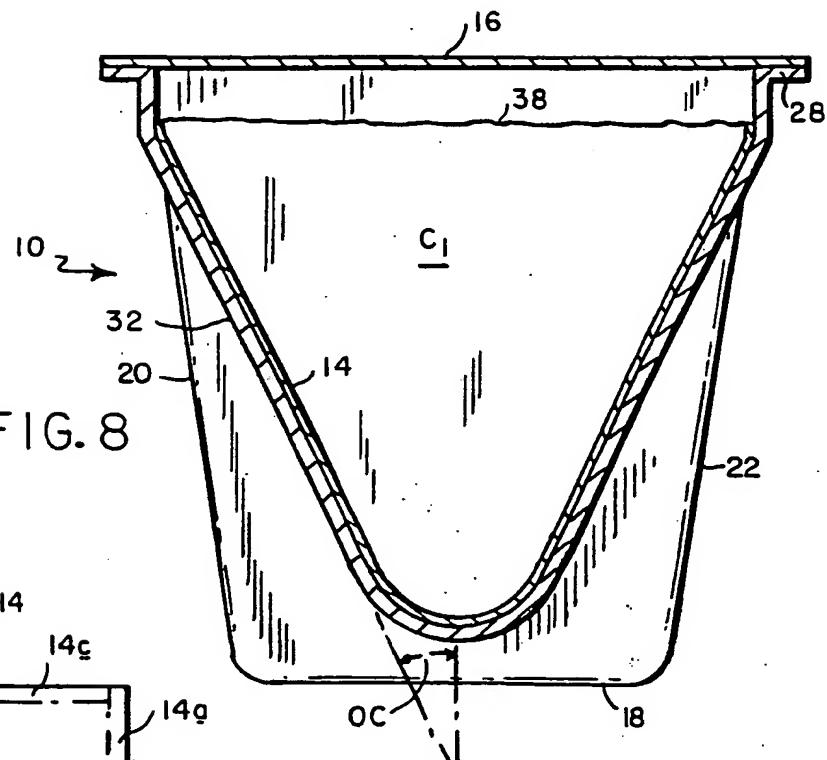


FIG. 8

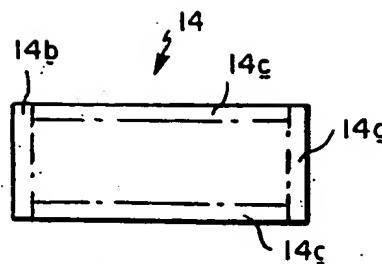


FIG. 9

## INTERNATIONAL SEARCH REPORT

International Application No.  
PCT/US 01/40123

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A47J31/06 B65D81/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 A47J B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, EPO-Internal, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 840 189 A (SYLAN ET AL) 24 November 1998 (1998-11-24) cited in the application column 2, line 66 -column 4, line 26; figures 1,2,4,5	1,3-6, 8-10,12
A	---	11,13
Y	US 4 550 024 A (LE GRANSE) 29 October 1985 (1985-10-29) column 3, line 57 -column 4, line 15; figures	1,3-6, 8-10,12
A	---	11,13
A	FR 2 118 368 A (HOBLIK ET BOUNHOL) 28 July 1972 (1972-07-28) page 2, line 18 -page 3, line 30; figure ---	1-4,6, 8-13
	-/-	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*Z\* document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

27 July 2001

07/08/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Palentlaan 2  
NL - 2280 HV Rijswijk  
Tel (+31-70) 340-2040, Tx. 31 651 epo nl.  
Fax: (+31-70) 340-3016

Authorized officer

Bodart, P

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/US 01/40123

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 86 09 418 U (DOUWE EGBERTS) 28 May 1986 (1986-05-28) abstract; claims; figures	2,11,13

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/40123

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 5840189	A	24-11-1998	US	5325765 A	05-07-1994
US 4550024	A	29-10-1985	NL	8300213 A	16-08-1984
			AT	25369 T	15-02-1987
			CA	1219139 A	17-03-1987
			DE	3462324 D	12-03-1987
			DK	23584 A, B,	21-07-1984
			EP	0114717 A	01-08-1984
			ES	277007 U	01-08-1984
FR 2118368	A	28-07-1972	NONE		
DE 8609418	U	28-05-1986	AU	583442 B	27-04-1989
			AU	6672986 A	25-06-1987
			CA	1271925 A	24-07-1990
			DK	618386 A	21-06-1987
			EP	0226260 A	24-06-1987
			NO	865208 A	22-06-1987